MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

ECP3126- KNOWLEDGE-BASED SYSTEMS

(TE & RE)

3 MARCH 2020
2.30 PM – 4.30 PM
(2 Hours)

INSTRUCTION TO STUDENTS

1. This question paper consists of 5 pages including cover page with 5 questions only.

2. Attempt **ALL** the **FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided.

Question 1

(a) How do you classify the AI searching algorithms? What are the steps involved in Hill climbing searching algorithm for an knowledge-based system.

[4 marks]

(b) Draw the life cycle model of knowledge-based system development and explain how it is different from the traditional software development life cycle.

[7 marks]

(c) The universe is assumed to be the set of numbers, P(x) represents x is positive, and N(x) represents, x is negative. Translate the following expression into predicate logic.
"Some numbers are positive and some are negative".

[2 marks]

(d) What are expert systems? Explain the purpose of the three important components of any expert system. Explain the responsibilities of the three types of personalities involved in any expert system.

[7 marks]

Question 2

(a) What is fuzzy logic? How is it differing from Boolean logic? Explain with your own example.

[4 marks]

(b) Design a fuzzy controller (specifying the fuzzy input sets, output sets along with their membership functions and rules) for a helicopter auto-pilot. The helicopter must hover at a height of 50m. A throttle position of 50% will keep the helicopter hovering at a fixed position (assuming no wind and other disturbance). A throttle position of 0% will make the helicopter fall at full speed, while a position of 100% will make the helicopter climb at maximum speed. The normal range of height is between 0 and 100m and the rate of change of height is from -15 to +15 m/s.

[10 marks]

(c) Explain the three important steps in modeling fuzzy expert systems

[6 marks]

Continued...

Question 3

(a) Define Artificial Neural network (ANN)? Explain why it is difficult to model a brain-like neural network.

[5 marks]

(b) Machine learning can be grouped into two broad learning tasks: Supervised and Unsupervised. Write the technical difference between these two learning types and describe any two algorithms for each type.

[7 marks]

(c) Design a McCulloch-Pitts neurons network model that can perform the ANDNOT logic function. Realize your design by using the truth table of ANDNOT logic function.

[8 marks]

Continued...

Question 4

(a) Consider the neural network shown in Figure Q4a with two inputs, two hidden neurons and two output neurons. Additionally, the hidden and output neurons will include a bias also.

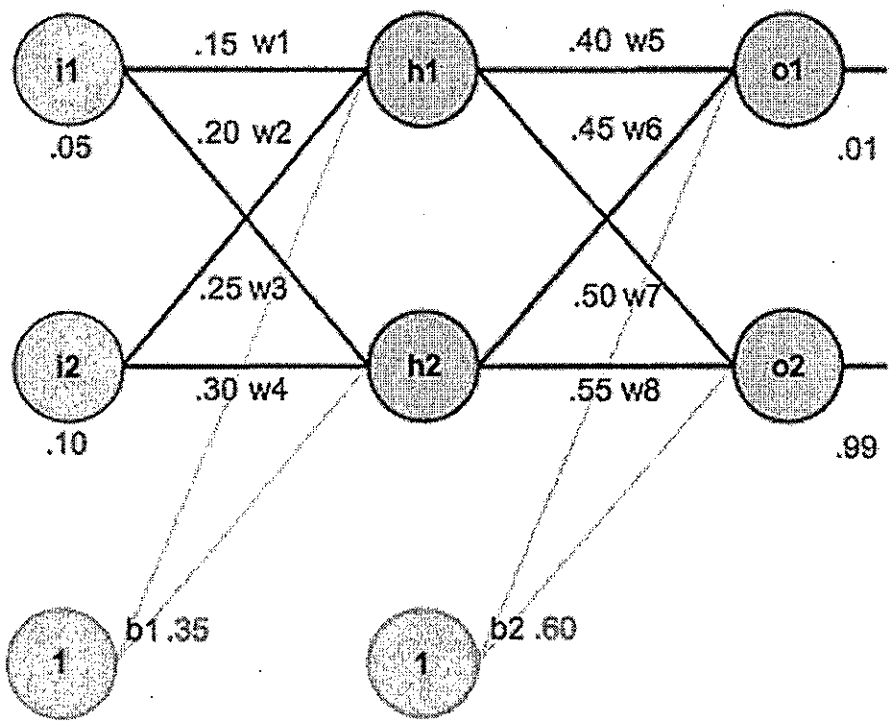

Figure Q4a

The network's weights have been initialized as shown in the figure Q4. Calculate the total error at the output for the given single training set: inputs 0.05 and 0.10 and the expected outputs 0.01 and 0.99.

Calculate the error for each output neuron using the squared error function and sum them to get the total error: $E_{Total} = \sum \frac{1}{2}(target - output)^2$

For computations assume Sigmoid activation function $\varphi(v) = \frac{1}{1+e^{-\alpha v}}$

With α equals to 1.

[10 marks]

Continued...

(b) The self-organizing Kohonen net as shown in the following Figure Q4b shows the input and the weights associated with each connection between the input and the Kohonen layer neurons. Assume the input is normalized and the training parameter α is 0.25.

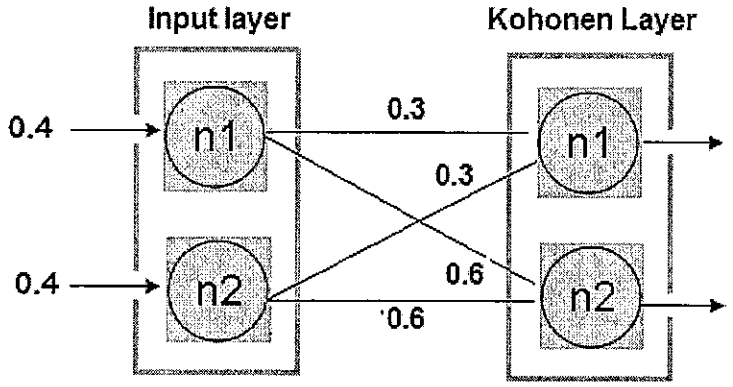

Figure Q4b

(i) Which Kohoenen layer neuron will fire? Why?

[3 marks]

(ii) Update the weights as per the output vector. Why should the weights be updated?

[3 marks]

(iii) What kind of algorithm is used in training the Kohoenen layer neurons? Why?

[2 marks]

(c) Describe the role of generalized delta rule in Back Propagation Training Algorithm.

[2 marks]

Question 5

(a) Explain how traditional programming differs significantly from machine learning?

[5 marks]

(b) What are the two important phases of Machine Learning? Explain them in detail.

[5 marks]

(c) Artificial intelligence and machine learning are disrupting and transforming businesses. Identify any four advantages of applying machine learning in telecommunication industry.

[4 marks]

(d) Explain any four best practices to consider while developing Chatbots for business.

[6 marks]

End of paper